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**Subject:** NIH News: Scientists Detect Two Decision-Making Pathways in Human Brain

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---Scientists Detect Two Decision-Making Pathways in Human Brain---

In a classic Aesop fable, the Ant diligently stores food for the upcoming winter, while the Grasshopper lounges in the summer sun oblivious to the impending change of season. Like the characters in this tale, people are often torn between impulsively choosing immediate rewards or more deliberately planning for the future. And now new research supported in part by the National Institute on Aging (NIA), a part of the National Institutes of Health (NIH), suggests why: human decision-making is influenced by the interactions of two distinct systems in the brain which-- like the Ant and Grasshopper--are often at odds.

The finding, published in the October 15, 2004, issue of Science has broad implications for predicting economic and behavioral health patterns, says Richard Suzman, Ph.D., Associate Director of the NIA's Behavioral and Social Research Program.

"This landmark study has the potential to reshape what we should look at as we try to understand how people make both health and economic decisions," Dr. Suzman says. "Since many health and economic decisions involve choosing between short term gratification and long term delays of rewards, this approach and its finding are likely to have a significant impact on our ability to influence health and economic behaviors such as diet, exercise, and saving for retirement."

For the study, a research team which included NIA grantee David Laibson, Ph.D., of Harvard University and the National Bureau of Economic Research in Cambridge, MA, asked 14 participants to choose between receiving money at an earlier or later date. For instance, a participant might be asked to choose between receiving \$27.10 today versus \$31.25 in a month; or \$27.10 in two weeks versus \$31.25 in six weeks. As the participants made these choices, their brains were scanned using functional magnetic resonance imaging (fMRI). This imaging tool enables researchers to measure second-by-second brain function in thousands of specific brain regions.

When participants chose between incentives that included an immediate reward, fMRI scans indicated heightened activity in parts of the brain, such as the limbic system, that are associated with emotional decision making. In contrast, deliberative and analytic regions of the brain,

such as the prefrontal and parietal cortex, were activated by all decisions, even those that did not involve an immediate reward. However, when participants resisted immediate rewards and instead chose delayed rewards, activity was particularly strong in these deliberative areas of the brain.

"Our research suggests that consumers have competing economic value systems. Our emotional brain has a hard time imaging the future, even though our logical brain clearly sees the future consequences of our current actions," Dr. Laibson says. "Our emotion brain wants to max out the credit card, even though our logical brain knows we should save for retirement."

Or, as the authors conclude, "The idiosyncrasies of human preferences seem to reflect a competition between the impetuous limbic grasshopper and the provident ant within each of us."

EDS: Richard Suzman, Ph.D., Associate Director of the NIA's Behavioral and Social Research Program, is available to comment on this study. To arrange an interview, contact Doug Dollemore, (301) 496-1752; [dollemod@nia.nih.gov](mailto:dollemod@nia.nih.gov)

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